

Noteworthy anatomical and physiological researches.**The plant cell and its organs.**

In 1892 three important papers were published on cellular structure, while smaller papers and contributions were issued abundantly. From Sachs¹ we have a short paper; from Bütschli² and Wiesner³ extensive books. The fundamental organ in the cell, according to Sachs, is "the nucleus, with that part of the protoplasm which surrounds it and governs it," and this organ is called an energid. Plurinuclear cells, therefore, are easily understood to be a system of organs, since these cells contain more than one energid, and the growth of the number of energids determines growth in general. In the continuation of his "Arbeiten" Sachs promises to give a full account of this theory.

Like Berthold,⁴ Bütschli regards the protoplasmic structure as an emulsion, and in proper mixtures he has been able to produce his "Schäume," which, when microscopically examined, appear to have a structure very much like that of the protoplasm, though, as Wiesner shows, the two do not result from the same molecular forces. Consequently Bütschli sees in the process of intussusception only diffusion.

Wiesner reviews at length the theories of Schwann,⁵ Nägeli,⁶ Pfeffer,⁷ Berthold, Strasburger,⁸ and Altmann,⁹ concerning cellular anatomy and physiology, and shows logical reasons why neither of these can be held as generally applicable. After showing, in a historical introduction, how the elementary structure and the growth of the living substance have been explained by previous authors, he states his own position in the following words:

"Between the visible structure of the organism and the molecular structure which is common to all matter, is an or-

¹Zur Zellentheorie. *Flora*, 1892. p. 58-63.

²Untersuch. üb. mikroskop. Schäume und das Protoplasma. Leipzig, Engelmann, 1892. 4°. 24 Mark.

³Die Elementarstruktur und das Wachsthum der lebenden Substanz. Wien, Holder, 1892. 6 Mark.

⁴Studien über Protoplasmamechanik. Leipzig, 1886.

⁵Mikroskopische Untersuchungen. Berlin, 1839.

⁶Die Stärkekörner. Zürich, 1858.

⁷Osmotische Untersuchungen. Leipzig, 1877, and *Pflanzenphysiologie*, 1. 1881.

⁸Histologische Beiträge II. Ueber das Wachsthum der Zellhäute. Jena, 1889.

⁹(a) Die Genese der Zelle. Leipzig, 1887; (b) *Archiv f. Anat. und Physiol.* 1889 (structure of nucleus); (c) die Elementarorganismen. Leipzig, 1890.

ganization of the simplest kind, and this I call the elementary structure." The visible structure of living beings may be studied up to a certain point, as it has been, yet it becomes almost necessary to have a further theoretical basis for the explanation of the many important results reached in the physiology of the vegetable cell, and this is furnished by the "plasome" of Wiesner. His theory has its foundation in the phenomena of division in the vegetable kingdom. Organized individuals, like nuclei, chlorophyll grains, plastids, etc., are not the elementary organisms in his mind, but, as all visible organic units in the cell are propagated by division, it is assumed that the elementary organs or plasomes are also formed and propagated this way. These plasomes "hold the specific properties of the living substance, undergo division, grow, and assimilate." Wiesner's book is written in admirable language, and will be of interest to both botanists and zoologists. It contains many useful notes, and may be regarded as being, in many respects, as important a contribution as Nägeli's "Stärkekörner" was.

Loew and Bokorny published¹⁰ a very interesting paper, „*Zur Chemie der Proteosomen*,“ which claims the correctness of earlier investigations against Klemms' objections. In the *Biologisches Centralblatt* XI, 5, and in *Nature* XLVI, 491, brief articles have been published on the same subject. The present paper deals almost exclusively with the "proteosomes," *i. e.*, globular masses formed in the living cells of a great many plants—*Spirogyra*, pistils of *Eugenia*, young leaves of *Mimosa pudica* and *Nymphaea Zanzibarensis*, young petals of *Drosera*, *Cyclamen*, *Tulipa*, etc.—when these are treated with a 0.5 per cent. solution of coffein or antipyrin. The proteosomes consist of "active albumen" which shows all the characteristic albumen reactions. In a *Spirogyra* thread the proteosomes are very easily seen when the cells are treated twenty-four hours with the solution of coffein, in which the plants keep alive for a number of days. In dead cells, however, the proteosomes have not the same properties as those mentioned above; while the globules of living cells are easily dissolved in water of 25°–30° C., those of the dead cells remain unchanged, and "display all the properties of common coagulated albumen." This latter form of proteosomes consist of "passive albumen."

¹⁰Flora, 1892. Ergänzungsband, p. 117–129.

These data can very easily be verified, and they are very instructive. Another question is, whether the "active albumen" is in any way connected with the "vital power" itself, and if we have here a reaction, from which we may judge whether life is present or not. The aldehyde theory, when employed here, can explain the vital power, but it seems a little incomprehensible that the vital power should merely be based upon chemical processes. Still, whether the theoretical deductions are provable or not, we have in Loew and Bokorny's investigations a very important contribution to cellular physiology.

In spite of the many efforts to the contrary, the door is being gradually opened to cellular and molecular physiology. Logical definitions and improved methods will be a mighty support. We have no doubt that the way to molecular physiology will be through the phenomena of the *cell-life* on one side and through the phenomena of *movement* on the other hand, and we shall see more and more clearly that "there is only one kind of life and one kind of physiology for all beings."—J. CHRISTIAN BAY.

Nutrition of insectivorous plants.

N. Tischutkin made a series of investigations on the activity of micro-organisms in the nutrition of insectivorous plants,¹⁴ which shows that in the secretion of insectivorous plants the proteid substances are altered through the influence of micro-organisms, especially bacteria; that such organisms are always living in the fluid excreted by fully developed insectivorous plants; that the process of digestion does not begin with the beginning of excretion of the digestive solution and does not occur until a sufficient number of micro-organisms are present; that the organisms effective here come from the air or from other sources; and lastly, that the part performed by the plant is only to furnish a substratum in which the micro-organisms may live. In the fluid of the secreting organs of *Pinguicula vulgaris*, *Drosera rotundifolia* and *longifolia*, *Dionaea muscipula*, and *Nepenthes Mastersi* several forms of bacteria were found, all being able to peptonize the albumen, and they were always living in the fluid. If these results prove to be correct, which is hardly to be anticipated, the theory of the digestive power of these plants together with

¹⁴Acta Horti Petropolitani XII, 1-19.